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Singing for Speech: A Choral Program for Communication Skills for Clients With Parkinson's. A review of the literature

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Abstract

Parkinson's Disease (PD) is a neuro-degenerative condition that impacts motor functions, causing tremors, postural instability, and difficulties initiating or coordinating movement. The resulting loss of oral-motor coordination, decline in respiratory function, and impacts on gait and posture all can affect the voice, leading to declines in effective expressive language. Challenges with communication can lead to social isolation and withdrawal. This literature review provides rationale for the establishment of a highly structured choir program, to be jointly administered by a certified music therapist and a licensed speech pathologist, to support speech and communication goals. The proposed protocol includes techniques derived from vocal pedagogy, speech pathology and music therapy, and includes a public performance component to provide motivation for participants and extension of practice to real-world applications.

Singing for Speech: A Choral Program for Communication Skills for Clients with Parkinson's

Introduction

As a singer and music therapist-in-training, I am interested in the potential for therapeutic interventions that utilize client singing as a means for supporting effective speech and communication. Research has demonstrated that singing utilizes and supports functions of the speech mechanism (Azekawa & LaGasse, 2017; Cohen & Masse, 1993; Haneishi, 2001; Tamplin et al., 2019). Studies suggest that singing may be inherently more motivating than speech exercises in encouraging clients to participate fully and effectively in vocal rehabilitation (Di Benedetto, 2009; Howland, personal communication, 2020; Tanner et al., 2016). Tamplin and Grocke (2018) state that, "singing may bypass the conscious thought processes involved in more cognitive, traditional speech therapy…[and may lead to] greater fluency and enhanced spontaneity in speech production"(p. 27).

People living with Parkinson's disease are one group that benefits from speech and language support. Parkinson's disease is a neuro-degenerative condition that impacts motor functions, causing tremors, postural instability, and difficulties initiating or coordinating movement (Duffy, 2005). The resulting loss of oral-motor coordination, reduced respiratory function, and impacts on gait and posture all can affect the voice, leading to declines in effective expressive language (Ramig et al., 2004; Ramig et al., 2008). Parkinson's patients may experience changes in speech volume, unusual prosody or speech rate, and breathy or hoarse vocal quality (Darley et al., 1975; Duffy, 2005). Such vocal characteristics may cause a decline in the ability to communicate effectively, with negative consequences for social and emotional connections, and may contribute to depression and social isolation (Jankovic, 2008).

For the purposes of this thesis, I researched existing programs and protocols for speech and communication goals for people living with Parkinson's disease, within the fields of music therapy and speech-language pathology. In Smolenski (2020), I proposed a program design that would incorporate

the principles of music therapy and speech-language pathology to support the speech and communication goals of people with Parkinson's disease, and be co-led by a certified music therapist and a licensed speech-language pathologist. The collaborative nature of the program was designed to incorporate the skills and scope of practice of both professionals (American Music Therapy Association, 2019; American Speech-Language Hearing Association 2016a; ASHA, 2016b; Certification Board for Music Therapists, 2015) in a synthetic format that takes advantage of the strengths of both specialties. This highly-defined choral singing program would include specific vocal warmup and cool down exercises, carefully-selected musical choices (identified for their impact on such goals as articulation, respiratory rates, and dynamic control), a social-conversational component, and a culminating performance.

Specifics of the protocol were devised based upon prior programs developed by professionals in speech pathology (Evans, 2012; Higgins & Richardson, 2019; Shih et al., 2012; Stiger et al., 2020) and music therapy (Azekawa & LaGasse, 2017; Cohen & Masse; 1993; Haneishi, 2001; Perez-Delgado, 2007; Stegemöller et al., 2017; Tamplin & Baker, 2017; Yinger & LaPointe, 2012), but the synthesis of the various strategies appears to represent a unique combination. No single Parkinson's choir program that I found included all of the following components: (1) joint administration of the protocol by a music therapist and a speech pathologist (Tamplin et al., 2019), (2) vocal exercises rooted in vocal pedagogy and speech therapy (Tanner, 2012; Tanner et al.,2016), (3) singing interventions grounded in music therapy (Stegemöller et al., 2017; Tamplin & Grocke, 2008; Yinger & LaPointe, 2012), (4) song learning and rehearsal (Higgins et al., 2019; Tamplin et al., 2019), (5) semi-structured conversation for extension of speech skills to natural conversation (Elefant et al., 2012; Haneishi, 2001; Tamplin et al., 2019), (6) take-home materials for between-session practice (Higgins & Richardson, 2019; Tanner et al., 2016), and (7) a concluding public performance (Parkinson's Foundation, 2021; Parkinson's Outreach Alliance, 2021).

In considering the choice of option for this thesis, I had initially planned to pursue Option 1 – Development of a Method, or Option 3 - Community Engagement Project. My work would have included developing and testing a prototype of a therapeutic choir program, then comparing its effectiveness upon measures of speech intelligibility to those of known speech-therapy techniques used for Parkinson's disease (Bryans et al., 2021; Ramig et al., 2004; Ramig et al., 2008; Thaut et al., 2015). In 2021, however, there are significant barriers to conducting any kind of in-person research, let alone an intervention that involves group singing, due to safety concerns related to the COVID-19 pandemic. According to Baht et al., (2020), singing involves a much higher potential for transmission of the virus that causes COVID-19, due to a higher rate and distance of droplet spray and aerosol dispersion during singing over normal speech.

With this in mind, my thesis is crafted as Option 2 - Critical Review of the Literature, with the method design presented as a proposal for future research. In this review, I outline prior research that describes the impact of singing on the speech mechanism, current speech therapy treatments for dysarthria due to Parkinson's disease, previously designed singing protocols for treatment of Parkinson's, and the current state of collaboration and conflict between the fields of music therapy and speech pathology. I then outline a proposed method for development of a therapeutic Parkinson's choir and suggest opportunities for future research into the comparative benefits of choral singing vs. Lee Silverman Voice Treatment on speech and communication outcomes.

Review of the Literature

Singing and speech

Singing shares physiological mechanisms with speech (Wan et al., 2010) and directly impacts the musculature involved in articulation, phonation, and respiration (Thaut, 2014). Singing has been used to support speech rehabilitation for those with aphasia, apraxia, dysarthria, and other conditions affecting speech and communication (Baker & Tamplin, 2006; Wan 2010). Due to both its general appeal and

functional similarities to speech (including rate, prosody, and diction), singing can be an effective part of speech rehabilitation (Cohen, 1993). The speech characteristics associated with neurologic impairment include a shift in the fundamental speaking frequency (pitch), the variability of speaking frequency (range), difficulty modulating intensity (volume), changes in rate or rhythm (prosody), and reduced oral-motor control (articulation) (Cohen, 1992; Cohen & Masse, 1994; Duffy, 2005; Ramig et al., 2001).

Cohen (1992) studied the effects of focused singing instruction on the speech characteristics of neurologically impaired adults through a series of single case studies. The treatment protocol included vocal exercises to focus on breathing, vocal range and diction; rhythmic speech exercises (e.g., reciting song lyrics or familiar phrases with metronomic cues), and 10 minutes of singing familiar songs. Participants in the test conditions all demonstrated improvement in measures of speech intelligibility from pre- to post-test evaluations, and with greater improvement than that of control subjects. "[N]eurologically impaired persons with expressive speech disorders can benefit from singing instruction, especially in the areas of speaking fundamental frequency variability, speech rate, and verbal intelligibility." (Cohen, 1992, pp. 99-100).

However, since the protocol included both singing and rhythmic vocal components, a follow-up study was designed to separate those features.

In an effort to isolate the impact of singing, the follow-up study by Cohen and Masse (1993) compared vocal interventions that incorporated either singing or purely rhythmic vocal instruction, with an additional non-treated control group for comparison. Both study conditions were administered by a music therapist, and measures of speech intelligibility were assessed by a speech pathologist. The singing group was the only condition to achieve improvement in ratings of speech intelligibility. The researchers suggested that the impact of singing instruction is related to the emphasis on vocal projections, breath support, expanded vocal range, and pitch matching, which were not present in the rhythmic speech coaching condition (p. 94).

Wan et al. (2010) reviewed evidence on the therapeutic effects of singing on several neurologic disorders, specifically on the ways in which it may be used to impact speech characteristics of people experiencing a range of conditions (including Parkinson's disease). They noted that "[s]inging in particular can serve as a valuable therapeutic tool because it is a universal form of musical expression that is as natural as speaking" (p. 287). They further posited that since singing uses all of the musculature responsible for respiration, phonation, articulation and resonance, and requires regulation of different inhalation and exhalation rates, it has the potential to be used to support the treatment speech abnormalities. Singing may also aid in relieving speech-motor difficulties by reinforcing the connection of words in normal prosody and increasing awareness of phonemes to support clearer articulation.

Singing utilizes all of the functions of the speech mechanism, supporting coordination of respiration, sustained phonation, resonance, articulation, and prosody. It carries the additional benefit of being essentially enjoyable for participants, enhancing motivation to participate and to sustain practice.

Speech therapy for Parkinson's

The neuro-degenerative progression of Parkinson's disease has wide-spread impacts on motor function and coordination (Duffy, 2005). The resulting declines in oral-motor coordination and respiratory function, as well as changes in gait and posture all can affect the voice, leading to declines in effective expressive language (Ramig et al., 2004; Ramig et al., 2008). Parkinson's patients may experience changes in speech volume, unusual prosody or speech rate, and breathy or hoarse vocal quality (Darley et al., 1975; Duffy, 2005). Support for speech intelligibility is frequently a major goal of speech therapy for clients with Parkinson's.

Originally developed in 1994 by Ramig and colleagues, Lee Silverman Voice Treatment (LSVT) is considered the "gold standard" for treatment of dysarthric speech in Parkinson's (Bryans et al., 2020;

Ramig et al., 1994; Ramig et al., 2004; Ramig et al., 2008; Ramig et al., 2001). This technique trains clients with Parkinson's to utilize extreme exaggeration of phonation and respiration in order to speak with a loud voice, through repetitive and intensive vocal exercises. This focus on loud speech encourages respiratory support, vocal intensity and may support functional communication (Mahler et al., 2015). Administering LSVT requires specific training and certification for the therapist and is conducted within very specific, high-intensity parameters: 60 minutes per day, for four consecutive days, repeated over four consecutive weeks, with at least 20-30 minutes of additional practice required daily on all non-treatment days. It also requires a high degree of commitment on the part of the client to practice the exercises diligently. Compliance can be challenging, as the protocol is highly repetitive and not inherently interesting. According to Kathleen Howland, one of a very few individuals certified as both a music therapist and speech pathologist, "LSVT works, but it's boring!" (K. Howland, personal communication, 2020)

A number of researchers have suggested that singing has a similar impact on the vocal mechanism (Azekawa & LaGasse, 2017; Cohen & Masse, 1993; Haneishi, 2001; Tamplin et al., 2019). Singing may be inherently more motivating than rote speech exercises, fostering better retention of and follow through by participants (Di Benedetto et al., 2009; Howland, personal communication, 2020; Tanner et al., 2016). The following section highlights some of the singing protocols that have been devised and tested with Parkinson's clients.

Singing protocols for Parkinson's treatment

In 2017, Tamplin and Baker reviewed and analyzed 26 publications that describe singing protocols for speech and voice goals for clients with acquired and degenerative speech disorders (including traumatic brain injury, stroke, and other sources of neurologic damage). Ten of these studies specifically addressed treatment of clients with Parkinson's (Azekawa & LaGasse, 2001; Di Benedetto et al., 2006; Elefant et al., 2012; Evans et al., 2012; Haneishi, 2001; Perez-Delgado, 2007; Shih et al., 2012;

Stegemöller et al., 2016; Thaut et al., 2001; Yinger & Lapointe, 2012), and I include several of these in this review. Tamplin and Baker's meta-analysis "… suggests that singing is an ideal therapeutic medium through which to address speech and voice goals because of the impact of singing and rhythm on neural activation and motor programming, the engagement of the entire speech system during singing, and the significant motivational factors that music brings to the therapy context." (2017, p. 122).

Haneishi (2001) expanded upon the work done by Cohen (1992, 1993) and developed a singing music therapy protocol (Music Therapy Voice Protocol – MTVP) that more directly addressed the speech needs of people with Parkinson's through attention to respiration and phonation. Effects studied included measures of intelligibility, acoustic characteristics of speech (intensity, range, maximum duration of phonation, pitch, and variability), and reported changes in clients' emotional state. Haneishi's protocol, tested as a series of individual case studies, began each session with brief conversation, and included warmups for the facial muscles and breathing mechanism, vocal exercises, song singing (with a focus on phrase length), extended vowel phonation, speech exercises, and concluded with conversation. Acoustic measures were collected at the beginning and end of each session as well as at the beginning and end of the five-week study period. Haneishi suggested that the nature of vocal and singing exercises with a focus on respiratory and phonatory effort can transfer to speech skills, through a combination of the repetition of vocal efforts, the enjoyability of singing itself, and the social aspects of singing.

> Successful experiences in singing might motivate the patients not only to participate in the treatment itself but also to use their new vocal skills in their functional speech outside the treatment. Singing also might encourage musical behaviors that may promote socialization. Since generalization from treatment setting to daily life is another critical issue of rehabilitation, the MTVP may have a great potential to facilitate this process (Haneishi, 2001, p. 288).

He further suggested that:

> Vocal and singing exercises with an emphasis on phonatory and respiratory efforts may have great potential to provide PD clients with stronger vocal projection, which enhances improvement in speech intelligibility. Vocal and singing exercises also may promote adherence to treatment and generalization from clinical settings to daily life (Haneishi, 2001, p. 289).

Tamplin and colleagues conducted several studies into the effect of vocal exercises and singing on dysarthric speech (Tamplin, 2008; Tamplin & Baker, 2017; Tamplin & Grocke, 2008; Tamplin et al., 2019). They suggested that techniques from music therapy that include oral motor and respiratory exercises help the brain to exert conscious control over the breath mechanism and that the rhythmic structure of song singing provides cues for naturalistic phrasing and breathing for speech (Tamplin, 2008). In devising a specific music therapy protocol, Tamplin and Grocke (2008) utilized a sequence of exercises that focused on the following : preparatory stretching and relaxation, oral motor and respiration, rhythmic articulation, melodic articulation, rhythmic speech cuing (rhythmic chanting of phrases for changing emphasis), vocal intonation therapy (sung phrases to reflect prosody of natural speech), and therapeutic singing (songs selected for specific phrase lengths, melodic range, and client preference). Regarding song choices for therapeutic singing, the authors note that "[C]areful selection of songs for treatment and the informed use of rhythm, melody and stress to reflect natural speech prosody when implementing vocal exercises are of vital importance" (p. 27). They suggested that singing is more motivating for participants in neurorehabilitation, as "singing may bypass the conscious thought processes involved in more cognitive, traditional speech therapy…[and may lead to] greater fluency and enhanced spontaneity in speech production" (p. 27).

Di Benedetto and colleagues (Di Benedetto, Cavazzon et al., 2009) proposed a treatment protocol (Voice and Choral Singing Treatment – VCST) that utilized separate speech therapy and choral singing sessions for clients with Parkinson's disease. In this study, the speech pathologist was an expert in both Parkinson's treatment and choral singing. Participants engaged in two hours per week of speech

therapy and two hours per week of choral singing. Notably, the stated focus of the speech sessions was on preparing the clients for participation in choral singing, rather than being directed at speech goals. Assessment of otolaryngological characteristics (e.g., vocal fold movement, closure), respiratory function, and voice characteristics was conducted pre- and post-study. Although not a controlled trial, the study suggested that clients showed improvements in respiratory pressure, phonation, and reading prosody, as well as decreased fatigue. The authors' primary conclusion was that "VCST could represent an amusing and agreeable treatment for PD speech and voice disorders, with some advantages in respect to previous treatment…[since] it can be administered for a long time with a [sic] good compliance" and "patients continue to take part to [sic] the choral activity with enthusiasm" (p.18). Researchers also point to the lower cost of treatment: 20 group speech therapy sessions and 13 choral singing sessions, compared to a standard LSVT protocol of 16 individual sessions per person (Ramig, 2008).

Yinger and Lapointe (2012) adapted Haneishi's MTVP protocol (Haneishi, 2001) in order to develop a program intended for group delivery. They note that social and recreational activities may alleviate the depression and social isolation that is common among people with Parkinson's (Moore and Seeney, 2007, in Yinger & LaPointe, 2012) and that choir singing has the potential to improve mood while positively impacting vocal production (Swedberg, 2010, in Yinger & LaPointe 2012). In selecting songs for group singing, they incorporated findings from Woolsey (2004) which indicated that "stimulative" songs (those with a faster tempo) help normalize speech rates, while "sedative" songs (those with a slower tempo) result in improved rhythm, initial and final consonants, and continuity of speech (Woolsey, 2004, in Yinger & Lapointe, 2012). Analysis of speech characteristics before and after the protocol indicated that "[C]ertain aspects of speech of individuals with PD, including intensity and volume, speech rate, speech intelligibility, breath control, and voluntary speech production, tend to improve after participation in a singing program designed by a music therapist" (p. 28). Limitations to

this study include lack of a control group and lack of control of participants' prior participation in other choral singing activities. Yinger and LaPointe posited that the effectiveness of a group singing protocol provides the combined benefit of being a rewarding leisure activity, offering opportunity for social interaction, and incorporating therapeutic interventions that improve or maintain communication abilities. Participation in a Parkinson's choir provides an incentive to work on and improve vocal functioning and may postpone or slow rates of neurodegenerative decline (Yinger & Lapointe, 2012).

Azekawa and LaGasse (2017) conducted a feasibility study to determine whether techniques from the field of Neurologic Music Therapy (NMT) (Thaut et al., 2014), which were developed for use with individual clients, could be applied to group singing applications. They expanded further on the protocols developed by Haneishi (2001) and Yinger and LaPointe (2012) with the addition of specific techniques from NMT. Measured outcomes included pre-and post- measures of sustained vowel phonation, articulatory control, and speech intelligibility, assessed by reading the Rainbow Passage (a standard reading passage that includes most of the sounds of spoken English that is often used for speech and language assessments). The intervention protocol utilized stretching and relaxation techniques for opening and closing the session, with the remainder of the exercises devoted to sung vocal techniques including Vocal Intonation Therapy (VIT) (Thaut, 2014) and Therapeutic Singing (TS) (Johnson, 2014),but removing the conversational component included by both Haneishi (2001) and Yinger and LaPointe (2012). Therapeutic Singing included two groupings of songs, the first enabling focus on articulation skills and the second supporting respiratory and phonatory skills (sustained tones and breath management). This group singing method did not include any kind of practice work to be carried out between sessions. Observed outcomes indicated positive impacts of using VIT and TS techniques in a group setting, and study insights suggested methods for music therapists to choose specific songs and exercises in order to target speech goals.

Tamplin et al. (2019) conducted a controlled trial study of a group singing protocol for Parkinson's disease. Their intervention design, called ParkinSong, was tested at two dosage levels (weekly and monthly) against active control groups who received other Parkinson's support activities at the same intervals. The protocol was administered jointly by a certified music therapist and a licensed speech pathologist, and utilized high-effort respiratory and vocal tasks, speech exercises, group singing and social conversation. Speech quality outcomes measured included vocal intensity and maximum expiratory pressure. Vocal intensity was selected for study since reduced loudness is a major impact of Parkinson's on the voice, and improvements in intensity can lead to improved intelligibility and confidence (Ramig et al., 2004). Vocal intensity is dependent, at least in part, on respiratory function, and singing demands higher respiratory effort (Wan et al., 2010). "Speech intelligibility is a crucial aspect of functional communication. A significant increase in vocal loudness would be expected to improve overall speech intelligibility" (Wan et al., p. 461). Participants were also asked to report on "voice-related quality of life", using the Voice Activity and Participation Profile (VAPP) (Ma & Yiu, 2001). The ParkinSong protocol included 30 minutes of "high intensity, music-based vocal exercises", with a focus on respiratory control, loudness, pitch control and speech clarification (p. 455); 60 minutes of singing familiar popular or traditional songs, with a focus on respiratory support and loud voice projection; and 30 minutes of social interaction and conversation, during which participants were encouraged to utilize the loud projection skills used during singing. Analysis of vocal intensity measures indicated that the weekly dosage was more effective, resulting in improvement in the study group compared to a decline or stable levels for those in the monthly dosage condition. Tamplin et al. (2019) concluded that "high-dosage (weekly), therapeutically informed, intensive effort singing increased vocal intensity, MEP [maximal expiratory pressure], and voice-related quality of life. Singing groups offer an engaging way to enhance voice and communication for people living with PD as well as providing opportunities for socialization" (p. 461).

Higgins and Richardson (2019) developed a choral singing intervention to be carried out with individuals with Parkinson's disease, and assessed specific speech parameters and speech intelligibility before and after the intervention. For their exploratory study, a convenience sample group was drawn from clients in a Parkinson's support group, with numbers balanced by gender. Pre- and post-testing included reading a standardized set of sentences. Recordings were analyzed for acoustic qualities, including formant frequencies of vowel sounds, and for intelligibility by naïve listeners. The 11-week choral intervention included physical and vocal warmup, breathing exercises, spoken conversation, and song singing. Speech intelligibility scores increased significantly post-treatment, suggesting that choral singing may be a viable contribution to speech treatment for people with Parkinson's.

Limitations of this study included the small sample size (n=10), and the relative homogeneity of the sample with respect to the participants' degree and specificity of impairment at the time. This sampling parameter was intentionally chosen in order to narrow variability for an initial study, but the authors suggested that a larger study might include participants with a wider range of starting speech intelligibility and other co-morbidities often present in the Parkinson's population. A randomized controlled trial with a non-treatment group with PD or with an alternate non-singing intervention protocol could be indicated. The authors also suggested that a future study might analyze spontaneous speech, instead of standardized sentences, as a means for extending the real-world validity of the work.

Tanner et al. (2016) developed and studied a singing activity rooted in vocal pedagogy and voice therapy, with the intent that it be usable by speech therapists, singing teachers, and choral conductors and that the focus on artistic expression would provide motivation for clients with Parkinson's to remain engaged in vocal therapy (Tanner, 2012; Tanner et al., 2016). They describe their method as "'exercise for the voice' us[ing] music and singing to increase the amount and rigor of vocalization and to make the repetition needed in treatment session [sic] and during homework more enjoyable…[T]he increased effort required in singing conditions the whole vocal system for increased effort in speech and helps to

obtain the effort levels practice in the LSVT LOUD program" (p. 201). [The protocol names LSVT and LSVT LOUD are used interchangeably in the literature.] The protocol included a focus on vocal intensity, range, breath support, facial movement, and posture. Measured outcomes included acoustic measures of vocal intensity and range of frequency (pitch modulation). The authors also considered the role of participation in group singing as part of the motivation for retention and the efficacy of the protocol (Clift and Hancox, 2001; Tanner et al., 2016), highlighting the benefits of social connection and networking. They referred to an idea posited by Clift and Hancox (2001), that the relative anonymity of singing in a group may allow participants to feel less self-conscious about their voices and be willing to sing out. "Choral singing creates opportunities for socialization and network building, and is an anonymous yet non-solitary form of creative expression" (Clift and Hancox, 2001, in Tanner 2016). They went on to suggest that "[t]hose who have lost articulation skills can express themselves and contribute to a beautiful group sound even though they are no longer able to participate fully in ordinary conversations… Good attendance was probably also due in part to the very human desire to express oneself vocally" (p. 208).

Tanner and colleagues acknowledged that their study did not fully isolate the respective impacts of the vocal exercises, song singing, and participation in a pleasurable group activity, but they suggested that the combination may be especially valuable — the use of the principles of vocal exercises for loud voice in combination with the social aspects that support motivation and retention may yield better, longer lasting impacts on clients' vocal quality and intelligibility.

Collaboration between speech-language pathology and music therapy

Given the intersection between singing and speech and the range of singing protocols that have been proposed separately and jointly by music therapists and speech-language professionals, the opportunity for collaboration in treatment seems opportune. While it is beyond the scope of this paper, there are disagreements at the level of the professional organizations that lead to conflicts regarding the

definitions of scope of practice as well as where boundaries and overlap between the professions exist. Fromius (2018) surveyed music therapists and speech-language pathologists and discovered asymmetrical perceptions of the professional boundaries between the professions and of the willingness to enter into co-treatment relationships.

Hobson (2006a, 2006b), on the other hand, suggested that there are great opportunities for professional collaboration between speech-language pathologists and music therapists in the treatment of neurogenic speech disorders, including Parkinson's disease. She highlighted the differences in scope of practice, such as the speech-language pathologists' expertise in assessment and diagnosis of speech disorders vs. the music therapists' understanding of the impact of specific aspects of musical interventions. She referred to the codes of ethics from both professions (American Music Therapy Association, 2019; American Speech-Language-Hearing Association, 2016), which each define their respective scopes of practice while including an obligation to work in collaboration with other allied health specialties (CBMT, 2015; ASHA, 2007) Hobson also noted specific methods that are common to both professions (e.g., Melodic Intonation Therapy) (Sparks, 1976, in Hobson, 2006a; Thaut, M. et al., 2015) that may confer ease of collaboration between speech-language pathology and music therapy professionals.

Hobson described several models for collaboration (2006b). In a *multidisciplinary* model (the least collaborative arrangement), each professional conducts separate assessments of a client, determines their own goals and interventions, and works independently of the others. This approach treats each specialty as unique and separate in its contribution to the client's treatment. In an *interdisciplinary* model, the treatment team may jointly define client goals, but each professional still provides individual assessment and treatment. Providers may share information and have an understanding of the others' scope of practice, but there may still be differences in vocabulary and approaches that may interfere with true collaboration (Drew and Hardman, 2000, in Hobson, 2006b). In

a *transdisciplinary* model, professionals from different specialties work simultaneously on joint goals and objectives. The focus is on the client's needs, with less separation of the professional disciplines. Each professional must be mindful of their own scope of practice, but there is ample room for a collaborative approach. The music therapist may rely on the speech pathologist's understanding of respiratory aspects of the vocal mechanism, and the speech pathologist may defer to the music therapist's knowledge of musical elements that support breath management. The transdisciplinary approach helps to define my proposed method for collaboration.

Felicity North is one of a very few professionals who are dual practitioners, certified both as a speech-language pathologist and as a music therapists (another is Kathleen Howland, consultant for this thesis). In her keynote to the Nordoff Robbins Plus Research Conference, entitled "Music and Communication: Music Therapy and Music Psychology" (North, 2014), she analyzed a series of music therapy sessions from the perspective of each profession and drew several conclusions from this joint attention. First, we can use music as a way to connect with those who may have challenges with communication, and to offer them ways to control the interaction through the music itself. Second, music therapists use music to develop and support communication and to build relationships. Third, music therapists use music to *sustain or re-establish communication* [italics mine]. She concluded by saying that "[f]or those for whom, for whatever reason, verbal communication is, or has become, difficult, music allows us to have this deepest communion" (p.790).

Another example of collaboration between music therapists and speech pathologists can be seen in the development of Speech-Music Therapy for Aphasia (de Bruijin et al., 2011). This protocol was devised to be provided as simultaneous treatment by a speech-pathologist and a music therapist to support speech and language goals for clients with aphasia or apraxia of speech, generally as a result of stroke or other non-congenital brain damage. The speech-language focus is on the production of phonemes, then words, then sentences. The music therapist uses singing as an entry point, transition to

chanting, then to normal speech. The two approaches interweave, with each professional administering exercises at the sound, word, and sentence (or phrase) level and with the music therapist additionally using musical elements (tempo, meter, rhythm, dynamics) to shape the exercises. While this protocol was not designed to address dysarthric speech, the principles of co-treatment might be used and adapted for expanded application.

Proposed Method

Although a number of prior researchers have devised singing protocols to support dysarthric speech due to Parkinson's, I envision the development of a new program that combines features of several different methods in a manner that appears to be novel to date. The current state of the COVID-19 pandemic precludes the piloting of such a program, but the following section will represent the method proposal that may be revisited at a future date.

Haneishi (2001) created a music therapy voice protocol that included physical and vocal warmup exercises, targeted song singing, speech exercises, and brief conversation, but it was tested as an individual protocol with a very small sample size (n=4). Yinger and LaPointe (2012) expanded upon Haneishi's protocol to apply it to a group setting, suggesting that participating with others would be more motivating for participants' engagement in therapeutic voice work. Azekawa (2017) focused specifically on using singing exercises rooted in Neurologic Music Therapy (NMT), including Vocal Intonation Therapy and Therapeutic Singing, and used reported client music preferences to help drive the clinician's specific choice of songs for singing. Tamplin and Baker (2019) devised a controlled trial of a singing protocol for patients with Parkinson's disease, with the intent of establishing 'dosage' of this type of music therapy intervention. They found statistically significant improvements of vocal intensity, speech intelligibility, and phonatory and respiratory measurements among participants in their program vs. controls, and they determined that weekly sessions yielded greater effects than monthly sessions. They also noted that "[s]inging groups offer an engaging way to enhance voice and communication for

people living with PD as well as providing opportunities for socialization" (p. 461). Based upon these protocols and others, I outline the following proposal for a therapeutic Parkinson's choir.

Choir protocol

The focus of the program is to use group vocal instruction, song singing, and performance as a means for supporting speech and communication goals for people with Parkinson's disease. This therapeutic Parkinson's choir meets weekly for 2 hours under the direction of both a certified music therapist and a licensed speech-language pathologist. Vocal exercises and musical content are selected by the two clinicians specifically to address aspects of vocal production that impact speech intelligibility, and each session includes breaks for social conversation and extension of vocal skills to natural speech.

Semester plan. The group meets weekly for 2 hours per session. Recorded materials, including an abbreviated vocal warmup routine and practice tracks for songs are provided for participants to sing at home between sessions. Each eight-week 'semester' concludes with a short performance for friends, families, and (perhaps) facility staff or interested members of the community. The public performance element may provide incentive for participants to work on their singing, encourage support by family, and serve as a way to promote the program to future participants or potential sources of funding. The program is structured in 8-week semi-closed semesters. New participants are encouraged to join for a full semester so that each cohort can build trust and camaraderie as they work together toward the culminating concert. Individual exceptions may be made at the discretion of the program clinicians. Participants are encouraged to re-enroll for subsequent semesters, enabling the choir to become established as an ongoing program.

Single session schedule. Each session begins with a 5-minute gentle physical warmup, including stretching (Azekawa & LaGasse, 2017; Cohen, 1992) gross motor movement (Higgins & Richardson, 2019; Yinger & LaPointe, 2012), self-massage of the face (Di Benedetto et al., 2009; Haneishi, 2001),

relaxation of neck and shoulders (Di Benedetto et al., 2009; Yinger & LaPointe, 2012), and attention to posture (Evans et al., 2012; Tanner et al., 2016; Yinger & LaPointe, 2012).

Next, five minutes are dedicated to breathing exercises, with a focus on deep abdominal breathing (Azekawa & LaGasse, 2017; Di Benedetto et al., 2009; Elefant et al.,2012; Yinger & LaPointe, 2012), extended exhalation (Haneishi, 2001; Tamplin et al.,2019), and rhythmic breathing (Evans et al., 2012; Higgins & Richardson, 2019; Tamplin et al.,2019; Yinger & LaPointe, 2012).

The next 15 minutes include a series of vocal warmup exercises, with attention paid to phonation (Di Benedetto et al., 2009; Higgins & Richardson, 2019; Stegemöller et al.,2017; Tamplin, 2008; Tanner et al., 2016; Yinger & LaPointe, 2012), range extension (Cohen, 1992; Elefant et al., 2012; Yinger & LaPointe, 2012), and articulation (Cohen, 1992; Di Benedetto et al., 2009; Evans et al., 2012; Haneishi, 2001; Stegemöller et al.,2017; Tamplin et al.,2019). These exercises may incorporate elements of Vocal Intonation Therapy (VIT) (Azekawa & LaGasse, 2017; Tamplin, 2008; Thaut, 2014). Semi-occluded vocal tract (SOVT) exercises (such as humming and lip trills) are included, as they help with coordination of vocal mechanism and appropriate respiratory pressure (Evans et al., 2012; Tanner et al., 2016; Stegemöller et al.,2017; Yiu & Ho, 2002 in Azekawa 2017).

Ten minutes are then dedicated to Therapeutic Singing (Azekawa & LaGasse, 2017; Elefant et al.,2012; Thaut, 2014), including the singing of rounds or other simple, familiar songs (Cohen, 1992; Haneishi, 2001; Stegemöller et al., 2017; Tamplin et al., 2019; Tanner et al., 2016) with focused attention on the phonation and articulation skills begun in warmups (Tamplin, 2008; Yinger & LaPointe, 2012).

The following 30 minutes are used for teaching and rehearsal of the songs to be included in the culminating performance. Music selections are chosen for their appeal to participants (Azekawa & LaGasse, 2017; Elefant et al., 2012; Han et al., 2018; Haneishi, 2001; Tamplin, 2008) as well as for specific musical characteristics that support clients' speech and communication goals (Fromius, 2018; Woolsey, 2004). These characteristics include length of phrases (Stegemöller et al., 2017), lyrics that

contain specific target sounds (Hobson, 2006a) or require clear articulation (Stegemöller et al., 2017), and tonal and dynamic range (Hobson, 2006a).

A ten-minute break at this point is used to encourage proper hydration (Azekawa & LaGasse, 2017), to allow for a physical break from standing or siting in place (Tanner et al., 2016), and to provide a semi-structured opportunity for social conversation (Elefant et al., 2012; Higgins & Richardson, 2019; Tamplin et al., 2019; Yinger & LaPointe, 2012). An open-ended Question of the Week (e.g. "What was the best thing you ever ate?" or "Where is your favorite place to be?") may be offered to stimulate conversation.

Following the break, an additional 25 minutes is spent on song singing (Higgins & Richardson, 2019; Tanner et al., 2016), with applied focus on phonation and articulation (Azekawa & LaGasse, 2017; Han et al., 2018). The two clinicians will then offer a five-minute recap of the session, reviewing highlights of the rehearsal and assigning homework for client work between sessions (Higgins & Richardson, 2019; Tanner et al., 2016).

The weekly session concludes with 15 minutes of social conversation, which provides opportunity and encouragement for the transfer of vocal skills to casual speech (Haneishi, 2001; Tamplin et al.,2019; Yinger & LaPointe, 2012) and builds camaraderie among group members (Clift & Hancox, 2010; Elefant et al.,2012).

Discussion

This proposed program design aims to incorporate the principles of music therapy and speech-language pathology to support the speech and communication goals of people with Parkinson's disease. The collaborative nature of the program is designed to incorporate the skills and scopes of practice of two certified professionals in a synthetic format that takes advantage of the strengths of both specialties. Specifics of the protocol were devised based upon prior programs developed by both speech and music therapy professionals, but the synthesis of the various strategies appears to represent new

thinking. No single Parkinson's choir program that I found included all of the following components: (1) joint administration of the protocol by music therapist and speech pathologist, (2) vocal exercises rooted in vocal pedagogy and speech therapy, (3) singing interventions grounded in music therapy, (4) song learning and rehearsal, (5) semi-structured conversation for extension of speech skills to natural conversation, (6) take-home materials for between-session practice, and (7) a concluding public performance.

Research has demonstrated that the LSVT technique is highly effective at addressing dysarthric speech, but patient compliance is often a challenge due to the repetitive nature of the exercises. Studies in the fields of both speech pathology and music therapy have indicated the benefits of singing as a therapeutic tool for speech goals. Group choral activities confer benefits of social connection and the enjoyment of singing and shared music, and naturalistic conversation assists with the transfer of skills from practice to real-life use. Including an element of public performance may confer additional motivation for participation as well as for distributed practice between sessions. A future research study could compare the improvement in speech and communication for clients participating in this Parkinson's choir versus those engaged solely in LSVT treatment. Testing should include standardized acoustic measures and rating of speech intelligibility by expert speech-language professionals (Bryans et al., 2020; Haneishi, 2001; Ramig et al., 2008; Ramig et al., 2001) measured prior to and following this choir protocol, and compared to the same measures from an active control group receiving only LSVT speech services. Clients' subjective reports of the impact of participation should be gathered, through a tool such as the Speech Intelligibility Inventory: Self-Assessment Form (Kent, 1994 in Haneishi, 2001), which asks participants and family members to report on functional communication and the degree of ease or difficulty clients have in various situations of daily life. Further extensions might include modification of this group singing protocol to address the needs of other specific diagnoses (e.g., dementia or acquired brain injury), inclusion of caregivers as equal participants in the choir program or

in a separate parallel ensemble, or testing efficacy of different program lengths for impact on music learning, group retention or durability of speech effects.

There are an estimated one million people in the United States with Parkinson's disease, with an additional 60,000 diagnosed every year (Marras et al., 2018). Based upon census projections and rates of estimated prevalence of Parkinson's disease in an aging population, that number is projected to exceed 1.2 million by 2030 (Marras et al. 2018). The economic burden on patients, families, and federal funding sources totals approximately $52 billion annually, with over $25 billion attributable to direct medical costs (medication, hospitalizations, therapeutic services) (Yang et al., 2020). Group therapeutic interventions are not only effective for supporting people with Parkinson's disease, but they can be much more cost-efficient as well (Evans et al., 2012). While precise cost estimates for LSVT vary based upon delivery services, insurance reimbursement, and other factors, the delivery format always comprises 16 one-on-one hour-long sessions with a certified clinician. My proposed group format would comprise the same number of clinical contact hours per semester (two hours per week for eight weeks), but it would incorporate co-treatment by two certified therapists and would reach multiple participants simultaneously. The cost of paying two therapists would be offset by the reduced need for funding separate individual speech and music therapy services for group participants. Even without precise financial data, economies of scale would indicate that this procedure should be a more cost-efficient way to support speech and communication goals for people with Parkinson's disease while remaining "an amusing and agreeable treatment for PD speech and voice disorders" (Di Benedetto, 2009). Future extension of this protocol to create therapeutic choir programs for people with dementia, stroke, traumatic brain injury, or other conditions that negatively impact speech and communication could lead to effective group-based singing treatments for an even larger number of people, that would be both cost-efficient and clinically sound.

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In the judgment of the following signatory this thesis meets the academic standards that have been established for the above degree.

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